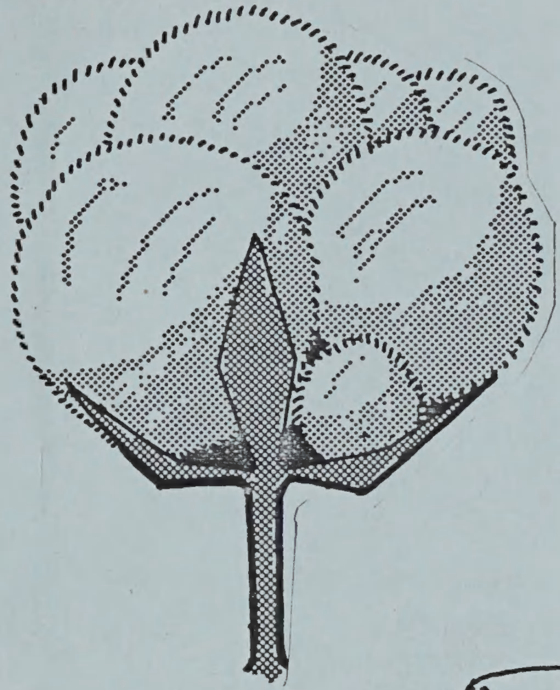
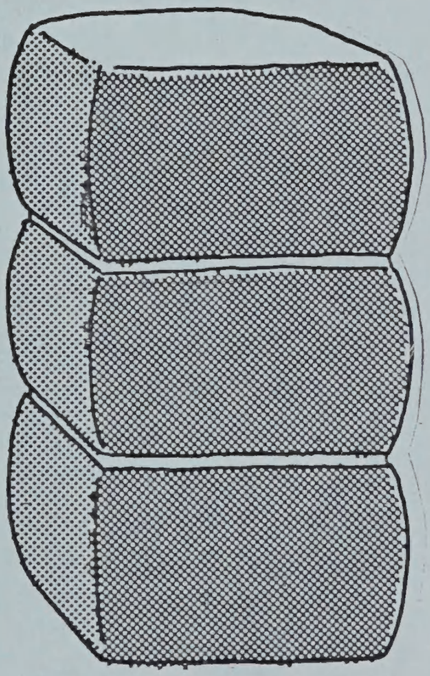
UMMARY OF COTTON RESEARCH
USDA-ARS
MID SOUTH AREA





STONEVILLE

MISSISSIPPI STATE

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NEW ORLEANS

Cotton Physiology and Genetics Research
Stoneville, Mississippi

PROGRAM MISSION

The mission of the Cotton Physiology and Genetics Research Unit is to (1) develop knowledge of the biology of the plant and its interaction with the environment; (2) discover heritable plant characteristics that confer resistance or tolerance to adverse environmental pressures including pests and diseases; and (3) use this knowledge to enhance production and improve the environment.

ARS PROGRAM IDENTIFICATION

2.2.1 Devise new methods for modifying germplasm of plants.

2.2.3 Improve genetic populations of field crops (cotton).

2.3.1 Discover knowledge of basic plant growth and development processes of crop species and of micro-organisms of agricultural importance.

2.3.3 Develop basic ecological principles and improved cultural and management practices for field crops.

2.4.5 Develop principles for protecting field and horticultural crops from losses caused by insect, nematodes, and pathogens.

CURRENT RESEARCH

1. Cotton germplasm basic research on gene transfer and sterility

   Determine the interaction of microclimate and cytoplasm (AD$_1$, AD$_2$, and AD$_3$) on yield.

2. Genetics of host plant resistance in upland cotton

   Investigate the interactions of genetic mixtures and light interception on earliness and stability of yield.

   Investigate the interaction of AD$_3$ cytoplasm and yellow pollen ($\underline{P}_1$,$\underline{P}_1$) on *Heliothis virescens* damage and yield of cotton.

   Investigate gene action and heritability of high lint percentage and selection efficiency for increased lint percentage in relation to increasing yield of cotton.

3. Physiological variation of upland cotton germplasm differing in productivity

   Perform single leaf and canopy photosynthesis measurements and growth analyses on 6 isogenic lines with different leaf morphologies.

4. Developmental physiology of cotton and cottonseed

   Evaluate oil:protein ratio of modern and obsolete cultivars and its relationship with seedling vigor.

   Determine the effects of field weathering and density on the physiological activities of germinating cotton seeds.

   Evaluate the chemical and biological effects of the *Gl* and *gl* genes on seed quality.

5. Growth regulators and harvest-aid chemicals for cotton

   Evaluate the interaction of growth regulators, cultivars, and environmental parameters on growth, fruiting, and development of cotton.

   Determine the effect of the growth regulator chemical Pix on planting seed quality.

   Investigate combinations of chemicals and application techniques that will terminate late-season growth, increase defoliation efficiency, and advance harvest schedules.

6. Methodology for the evaluation of genetic resistance to cotton insects

   Develop field and laboratory techniques for detecting genetic resistance to *Heliothis virescens* and *Lygus lineolaris*.

7. Cotton disease control in the Midsouth

   Continue to investigate the response of obsolete and modern cultivars to Treflan.

   Evaluate genotypes for resistance to seedling and major diseases.

   Evaluate seed fungicide treatments for specific pathogens.

   Continue to direct the National Cottonseed Treatment Program.

PERSONNEL

William R. Meredith, Jr., Research Leader, Supervisory Geneticist
Earl B. Minton, Plant Pathologist
Jack C. Bailey, Research Entomologist
Randy Wells, Plant Physiologist
Harry R. Leffler, Plant Physiologist
George W. Cathey, Plant Physiologist

ADDRESS

Cotton Physiology and Genetics Research
Delta States Research Center
Mid South Area, SR, ARS, USDA
P.O. Box 225
Stoneville, Mississippi 38776

TELEPHONE

Comm:	(601) 686-2311
FTS:	497-2241, 497-2242

Field Crops Mechanization Research
Stoneville, Mississippi

PROGRAM MISSION

The mission of the Field Crops Mechanization Research Unit is to develop and interface equipment and cutural practices into profitable monoculture, double cropping, and rotational production systems for cotton, soybeans, rice, and small grains that will optimize production, conserve natural resources, and enhance environmental quality. This will be done by integrating tillage equipment and cultural practices to facilitate adaption of controlled-traffic production systems that reduce energy inputs; establishing primary and secondary tillage criteria that will provide a maximum level of available water to soybean plants from rainfall and supplemental irrigation to maximize return; investigating and developing methods for harvesting field crops that will maintain the inherent quality of the crop, increase machine efficiency, and reduce harvest loss; developing conservation tillage systems to conserve soil and water resources; developing planting and production equipment to optimize seed germination, emergence, and growth for double cropping systems on various soil types; and interfacing basin tillage equipment with irrigation to minimize production risks due to unpredictable climates.

ARS PROGRAM IDENTIFICATION

1.2.1 Develop cost effective conservation technologies for controlling soil loss from croplands and rangelands.

1.2.3 Devise techniques for improving, maintaining, or restoring the physical conditions of soils that are needed for optimum crop production.

1.3.2 Develop methods for increasing conserving, and managing water supplies available for agriculture, for improving water quality, and for reducing croplant damage from flooding.

1.4.1 Develop systems and models for designing resource management strategies that optimize agricultural production and resource conservation.

2.3.3 Develop basic ecological principles and improved cultural and management practices for field crops.

2.3.6 Discover principles for and develop criteria and specifications for improving the efficiency of agricultural production and protection equipment and practices.

6.1.3 Establish and operate multivariate experiments on integrated agricultural systems to validate models, facilitate technology transfer, and serve as a base for agricultural productivity forecasts.

CURRENT RESEARCH

1. Develop technology for cotton production systems and equipment which enhances profit and conserves natural resources

   Cotton varieties grown with and without irrigaton in 30- and 40-inch rows are being evaluated for production potential and fiber quality when harvested with a spindle harvester.

   Cotton production systems which include the use of various cover crops and several secondary tillage systems are under evaluation to determine effects on line production, stand establishment, and early season weed control.

   Hairy and smooth leaf cotton varieties are being evaluated under varying harvest and lint cleaning systems for effects on lint quality and yield.

   Energy requirements for equipment used with cotton production systems is being evaluated in order to optimize production systems from the standpoint of energy efficiency.

   An experimental material for spindle doffers used on cotton harvesters is being evaluated for reduction of "black speck" lint contamination and wear resistance.

   A joint study involving three states (MS, TX, CA) is underway to evaluate the effects of variety and location on byssinosis and level of cotton dust generated during mill processing

2. Develop technology for soybean monocrop, multiple crop, and rotation production systems that increases production and profits and conserves energy and natural resources

   Wheat-soybean double crop production systems with either conventional, minimum, or no-till land preparation are being evaluated on clay and sandy loam soils in both irrigated and nonirrigated environments.

   Rotational cropping studies that include soybeans, corn, grain sorghum, and wheat are being evluated to determine the long range effect on yields, soil physical properties, and water infiltration and conservation.

   The stale seedbed approach to planting soybeans is being evaluated to determine the relationship of tillage and planting date to crop yields.

   Studies are being conducted to relate combine operating parameters to soybean harvest loss for determinate varieties of the Mid-south.

3. Develop basic concepts for enhancing infiltration rates, physical structure, and drainage of heavy soils in order to increase production and conserve natural resources

   A data base of descriptive parameters associated with research plot soils is under development and includes mechanical analyses, moisture tension versus moisture content relationships, and hydraulic conductivity.

   Soil conditioners and tillage treatments are being evaluated for effects on infiltration rates, soil moisture storage, soil oxygen content, and plant root poliferation.

   The persistence of soil aggregation associated with both noncompacted and compacted heavy soils is being evaluated after exposure to wetting and drying cycles.

PERSONNEL

J. R. Williford, Research Leader, Supervisory Agricultural Engineer
R. A. Wesley, Agricultural Engineer
L. A. Smith, Agricultural Engineer

ADDRESS

Field Crops Mechanization Research
Mid South Area, SR, ARS, USDA
P.O. Box 36
Stoneville, Mississippi 38776

TELEPHONE

Comm: (601) 686-9311
FTS: Switchboard - 497-2110

Southern Field Crop Insect Management Laboratory
Stoneville, Mississippi

PROGRAM MISSION

The mission of the Southern Field Crop Insect Management Laboratory is to conduct fundamental research on the biology and ecology of field crop insect pests and their natural enemies; develop innovative biological, autocidal, cultural, and chemical methods for suppressing insect pests; and integrate this knowledge into insect management systems. A goal of this laboratory is to develop new insect suppression strategies for population management to improve crop production efficiency. The midsouth agroecosystem will be emphasized.

ARS PROGRAM IDENTIFICATION

2.4.1 Develop knowledge of growth, development, and behavioral and population processes of insects as a basis for discovering control principles.

2.4.5 Develop principles for protecting field and horticultural crops from losses caused by insects, nematodes, and pathogens.

2.4.9 Develop fundamental principles of biological control for pests of crop plants.

PERSONNEL

E. G. King, Laboratory Chief

ADDRESS

Southern Field Crop Insect Management Laboratory
Delta States Research Center
Mid South Area, SR, ARS, USDA
P.O. Box 225
Stoneville, Mississippi 38776

TELEPHONE

Comm: (601) 686-2311
FTS: 497-2231

Biology and Biocontrol of Insects Research

PROGRAM MISSION

To develop new knowledge on biology of field crop insects for development of new and improved control principles and to establish fundamental principles for encouraging and using natural enemies more effectively.

CURRENT RESEARCH

1. Elucidate the efficacy of indigenous predators and parasites, particularly of cotton bollworm and tobacco budworm.

2. Release exotic predators and parasites and evaluate them for establishment on field crop insect pests.

3. Receive and clear exotic organisms through Stoneville Research Quarantine Facility for biological control of insect pests and weeds.

4. Research and develop methods for augmenting predator and/or parasite populations to manage insect, particularly cotton bollworm and tobacco budworm, populations of field crops in the midsouth.

5. Develop new knowledge on mirids (plant bugs), particularly *Lygus lineolaris*, for elucidation of the interaction between them and their host plants.

6. Develop new knowledge on biology and behavior of *Heliothis* spp., initially emphasizing genetic characterization of the subgenus *Helicoverpa* for establishment of a cotton bollworm sterile hybrid.

PERSONNEL

E. G. King, Research Leader, Supervisory Research Entomologist
W. A. Jones, Research Entomologist
J. E. Powell, Research Entomologist
O. P. Young, Research Entomologist
W. W. Harrison, Entomologist and Quarantine Officer

Other

C. Goodpasture, Assistant Entomologist, MAFES
D. F. Martin, Collaborator

Insect Population Ecology Research

PROGRAM MISSION

To develop and integrate insect suppression strategies into systems that minimize the cost of plant protection yet are ecologically acceptable.

CURRENT RESEARCH

1. Assess the role of early season host plants in bollworm/budworm population development and devise new and innovative tactics for suppressing these populations.

2. Develop chemical/biorational control tactics for use in integrated systems.

3. Develop monitoring and predictive technology through quantitative population ecology for field crop insect pests that impact on crops in broad geographical areas of the U.S., particularly *Heliothis* spp. and velvetbean caterpillar.

4. Conduct systems analysis and develop models for evaluation of suppression strategies.

PERSONNEL

J. W. Smith, Research Leader, Supervisory Research Entomologist
T. R. Pfrimmer, Research Entomologist
W. P. Scott, Research Entomologist
E. A. Stadelbacher, Research Entomologist
T. C. Cleveland, Research Entomologist
J. M. McWilliams, Research Entomologist
K. R. Hopper, Research Ecologist
S. B. Stark, Research Ecologist

Other

C. L. Snodgrass, Assistant Entomologist, MAFES
C. R. Parencia, Collaborator

Southern Weed Science Laboratory
Stoneville, Mississippi

PROGRAM MISSION

The mission of the Southern Weed Science Laboratory is to develop more efficient and more effective methods of controlling weeds through: (a) improved methods that reduce losses in yield and quality and reduce the cost of control and energy requirements in crops; (b) increased fundamental knowledge of the ecology, biology, and biochemistry of weeds, including principles, and mechanisms of their control by biological, chemical, cultural, ecological, physical, and integrated management systems that maintain and improve quality of the environment; and (c) improved weed control technology to increase efficiency in production of food, feed, and fiber.

ARS PROGRAM IDENTIFICATION

2.4.6 Develop knowledge of the basic biology of weeds determining their vulnerability to control.

2.4.8 Develop control technology for reducing losses caused by weeds in field and horticultural crops.

2.4.9 Develop fundamental principles of biological control for pests of crop plants.

PERSONNEL

Chester G. McWhorter, Laboratory Chief

ADDRESS

Southern Weed Science Laboratory
Delta States Research Center
Mid South Area, SR, ARS, USDA
P.O. Box 225
Stoneville, Mississippi 38776

TELEPHONE

Comm: (601) 686-2311
FTS: 497-2221

Agronomic Weed Control and Pesticide Application Research

PROGRAM MISSION

To develop principles and practices for controlling weeds in soybeans, cotton, corn, sorghum, and other agronomic crops to reduce yield losses and the cost of weed control.

CURRENT RESEARCH

1. Discover more effective cultural, mechanical, and chemical methods for integrated weed management programs.

2. Develop crop rotations for more effective weed control.

3. Develop new and improved means of applying herbicides.

4. Determine life histories of problem weeds; i.e., johnsongrass, nutsedge, morningglory, spurred anoda, perennial vines, etc., to establish vulnerable stages to control treatments.

5. Develop more efficient weed control programs for use in crop monoculture and in rotations to reduce tillage and conserve energy.

PERSONNEL

C. G. McWhorter, Research Leader, Supervisory Plant Physiologist
J. E. Dale, Plant Physiologist
F. E. Fulgham, Agricultural Engineer
W. R. Azlin, Agronomist
C. T. Bryson, Research Botanist

Biological Weed Control Research

PROGRAM MISSION

To develop new and innovative methods of using biological control agents as components in integrated systems for managing weeds in crops.

CURRENT RESEARCH

1. Identify and develop native and exotic weed pathogens and insects for biological weed control.

2. Develop methods for manipulating and releasing weed pathogens and weed feeding insects in integrated pest management systems

3. Develop methods for maintaining and increasing cultures of biocontrol agents (pathogens and insect) for research.

4. Study weed/bioagent ecology and distribution to determine potential and efficacy of biological control agents.

5. Develop methods for the discovery, evaluation, and utilization of natural toxins or chemicals for weed management systems.

PERSONNEL

P. C. Quimby, Research Leader, Supervisory Plant Physiologist
H. L. Walker, Plant Pathologist
N. R. Spencer, Entomologist

Herbicide Performance, Efficiency and Safety Research

PROGRAM MISSION

To develop effective weed control practices that are more efficient and safe to crops, man, and the environment by: (1) developing methods for evaluating and predicting the behavior and pollution potential of herbicides in the soil/water/plant complex; (2) developing methods, techniques and materials for altering behavior to reduce adverse impacts on crops and the environment; (3) determining the effects of long-term repeated use of herbicides on soil health and crop yields.

CURRENT RESEARCH

1. Investigate factors that affect herbicide persistence.

2. Evaluate controlled-release techniques.

3. Measure efficiency of herbicide application (factors controlling rates required for control of weeds).

4. Relate adsorption-desorption of herbicides to soil surfaces and to efficacy and persistence.

5. Determine the immediate and long-term effects of herbicides on soil microorganisms.

PERSONNEL

R. D. Wauchope, Research Leader, Research Chemist
William C. Koskinen, Soil Scientist
Thomas B. Moorman, Microbiologist

Weed Biology and Mechanisms of Control Research

PROGRAM MISSION

To discover new knowledge of weed biology and herbicide action in order to develop better and less costly weed control methods.

CURRENT RESEARCH

1. Determine environmental or physiological factors that influence herbicide actions in weeds and crops.
2. Determine mechanisms by which herbicides, phytotoxins, and other chemicals kill weeds.
3. Determine physiological, environmental, or allelopathic factors which influence establishment or shifts of weed populations.
4. Determine how long weed seeds will remain alive in the soil.
5. Determine methods of inducing weed seed germination and reducing dormant weed seed populations in soil.

PERSONNEL

G. H. Egley, Research Leader, Supervisory Plant Physiologist
S. O. Duke, Plant Physiologist
R. E. Hoagland, Chemist
C. D. Elmore, Plant Physiologist
K. C. Vaughn, Plant Physiologist
R. N. Paul, Biologist

U.S. Cotton Ginning Laboratory
Stoneville, Mississippi

PROGRAM MISSION

The mission of the U.S. Cotton Ginning Laboratory is to develop more efficient and effective gin processing methods to (1) improve cotton producer income, (2) enhance the quality of Midsouth cotton, (3) lower cotton gin operating costs, and (4) control the quality of air within the gin and emitted into the atmosphere.

ARS PROGRAM IDENTIFICATION

4.1.4 Devise concepts for innovative and improved processes and products.

4.2.1 Identify and, when necessary, develop the means for removing intrinsic toxic factors of practical significance.

CURRENT RESEARCH

1. Ascertain the relative effects of cotton harvesting method, and gin cleaning methods on lint market value, bale value, and cash value per acre for Midsouth cotton producers.

2. Discover the principal causes of imperfections in ginned lint such as fiber neps and seedcoat particles and develop the technology to prevent their occurrence.

3. Develop a cotton ginning simulation program(s) for model studies of ginning systems, and adapt it for automatic gin machinery control for maximum lint value from inputs including gin machinery type and lint market value.

4. Develop cotton dust and noise abatement technology to lessen employee health hazards in gins.

PERSONNEL

A. C. Griffin, Jr., Research Leader, Supervisory Physicist
W. S. Anthony, Agricultural Engineer
S. T. Rayburn, Agricultural Engineer
G. J. Mangialardi, Jr., Agricultural Engineer
E. P. Columbus, Agricultural Engineer

ADDRESS

U.S. Cotton Ginning Laboratory
Mid South Area, SR, ARS, USDA
P.O. Box 256
Stoneville, Mississippi 38776

TELEPHONE

Comm: (601) 686-2385
FTS: 497-2402

Crop Science Research Laboratory
Cotton Host Plant Resistance
Mississippi State, Mississippi

PROGRAM MISSION

The mission of the Cotton Host Plant Resistance Unit in the Crop Science Research Laboratory is to discover and genetically understand lines of cotton resistant to insect, nematode, and disease pests, especially Heliothis, tarnished plant bug, boll weevil, root-knot nematodes, and fusarium wilt and to combine these into agronomically desirable germplasm sources which also have good resistance to the major cotton diseases. The wild races and species of cotton are researched for sources of resistance. Mechanisms of resistance and biochemical basis are determined wherever possible. New sources of disease resistance are searched for. The wild cotton race germplasm is enhanced by genetic conversion to day-neutral status. These improved strains are released to the public as germplasm. This mission is developed under Objective 2 of the strategic plan--Develop the means for maintaining and increasing the productivity and quality of crop plants.

ARS PROGRAM IDENTIFICATION

2.1.2 Collect, evaluate, preserve, and make accessible new sources of germplasm of plants and other organisms and assess their potential for meeting agricultural and industrial needs.

2.2.3 Improve genetic populations of field crops.

2.4.1 Develop knowledge of growth, development, and behavioral and population processes of insects as a basis for discovering control principles.

2.4.2 Develop knowledge of etiology, epidemiology, and pathogenicity of plant pathogens as a basis for discovering control principles.

2.4.3 Develop knowledge of growth, development, and behavioral processes of nematodes as a basis for providing control technology.

CURRENT RESEARCH:

1. Broaden germplasm resources in cotton by utilizing primitive race stocks

Primitive cottons in the regional collection are systematically being converted to genetic stocks that will flower in the U.S. and are being released to public and private breeders.

As primitive cottons are converted to flowering types, new types and new useful genes to improve cotton are being identified.

2. Develop improved populations of cotton with resistance to insects, nematodes, and improved yield and fiber

   Converted flowering primitive cottons are evaluated for resistance to tobacco budworm and root-knot nematodes to discover for new sources of resistance.

   Improved techniques for evaluating cotton lines for tobacco budworm and root-knot nematode resistance are being developed.

   Several primitive cotton lines are resistant to boll weevil. Advanced breeding lines which are resistant to boll weevil are being developed for release.

   Relationships between pest resistant traits and agronomic traits of yield, maturity, and fiber properties are being determined.

   The genetic basis and breeding behavior of new sources of resistance to tobacco budworm and root-know nematode are being determined.

   Several basic genetic studies are underway to better understand cotton genetics and breeding.

3. Develop a basic understanding of insect behavior as it relates to plant-insect interactions

   Basic feeding behavior of various early stages of tobacco budworm larvae is being studied.

   Relationship between plant growth stages and tobacco budworm damage and behavior are being determined and modeled.

   The relationships between behavior of tobacco budworm on resistant and susceptible cotton lines are being studied.

4. Develop knowledge of chemical and biological mechanisms responsible for resistance to tobacco budworm, boll weevil, and root-knot nematode

   Chemicals in cotton which adversely affect growth of tobacco budworm and root-knot nematode are being investigated.

   Effects of growth regulators such as PIX on natural resistance of cotton to tobacco budworm are being determined.

   Effects of variety, physiological stages, and environment on naturally occurring chemicals in cotton which relate to resistance to tobacco budworm and root-knot nematode are being determined.

   Distribution and location of naturally occurring chemicals in cotton that confer various levels of pest resistance are being determined; for example, the relationship between density of gossypol glands and gossypol content.

PERSONNEL

Johnie N. Jenkins, Research Leader, Supervisory Research Geneticist
William L. Parrott, Research Entomologist
Jack C. McCarty, Jr., Research Agronomist
Raymond L. Shepherd, Research Agronomist
Albert J. Kappelman, Jr., Research Plant Pathologist

ADDRESS

Cotton Host Plant Resistance Research
Crop Science Research Laboratory
Mid South Area, SR, ARS, USDA
P.O. Box 5367
Mississippi State, MS 39762-5367

TELEPHONE

Comm: (601) 323-2230
FTS: 497-1105

Crop Simulation Research
Mississippi State, Mississippi

PROGRAM MISSION

The mission of the Crop Simulation Research Unit is to develop models simulating growth and yield of agronomic crops using systems methodology and controlled environment experiments. Models will be field validated and applied in large area yield prediction as well as in tillage, fertilizer, irrigation, pest management decision making, and crop breeding.

ARS PROGRAM IDENTIFICATION

2.3.1 Develop knowledge of basic plant growth and development processes of crop species and of micro-organisms of agricultural importance

2.3.3 Develop basic ecological principles and improved cultural and management practices for field crops.

2.5.1 Develop the means for assessing crop conditions, and identify the factors that limit yields of major crop commodities.

6.1.2 Develop predictive models for simulating the effects of key physical and biological factors on agricultural productivity and environmental quality.

CURRENT RESEARCH

1. Simulation models for large area yield forecasting

Simulation models are being developed for cotton, wheat, and soybeans which can be used with satellite data to refine crop predictions in the United States and overseas.

Simulaton models are developed that are general and can be used to predict results of new combinations of soil and climate inputs.

2. Development of crop simulation models for farm management decision making

Models are developed with sufficient physiological and soils base to study crop responses to tillage, irrigation, fertilizer inputs, and placements.

Models are developed to incorporate insect and disease models to allow decision making in these areas.

Basic information is packaged in computer models to allow direct application by farmers and extension workers.

3. System design research

Crop growth simulation models are being developed which evaluate new combinations of genotype, cultural, and climate inputs.

Models used in research feasibility studies in breeding, tillage, drainage, fertilizer experiments, and in assessing impact of climatic change.

4. Basic science

Crop growth simulation to assess the physiological knowledge and scientific literature on plant behavior and developmental processes and to study areas not now understood.

Cotton, wheat, and soybean models are used as tools to guide the research to better understand how plants grow and interact with their environment.

PERSONNEL

Donald N. Baker, Research Leader, Research Agronomist
Robert E. Fye, Research Entomologist
James M. McKinion, Electronics Engineer

ADDRESS

Crop Simulation Research
Crop Science Research Laboratory
Mid South Area, SR, ARS, USDA
P.O. Box 5367
Mississippi State, MS 39762

TELEPHONE

Comm: (601) 323-2230
FTS: 497-1151

Cotton Physiology Research Unit
Knoxville, Tennessee

PROGRAM MISSION

The mission of the Cotton Physiology Unit at Knoxville, TN, is to (1) determine the developmental, physiological, biochemical, and genetical processes occurring within the cotton seed and fiber which control differentiation of the tissues into the harvested product; and (2) develop genetic resources, including exotic germplasm, that can be used as tools for the mission, and as new sources of germplasm for cotton breeders.

ARS PROGRAM IDENTIFICATION

2.1.1 Develop an understanding of the taxonomic relationships among plants, beneficial organisms, and pests as the basis for research to enhance crop production and protection.

2.1.2 Collect, evaluate, preserve, and make accessible new sources of germplasm of plants and other organisms and assess their potential for meeting agricultural and industrial needs.

2.2.1 Devise new methods for modifying germplasm of plants, beneficial organisms, and pests.

2.2.3 Improve genetic populations of field crops.

2.3.1 Develop knowledge of basic plant growth and development processes of crop species and of micro-organisms of agricultural importance.

CURRENT RESEARCH

1. Histochemistry of fiber differentiation.

2. Effect of transcription and translation inhibitors on development of _in vitro_ cultured ovules and fibers.

3. Detection of fiber specific proteins during fiber development.

4. Isolation and translation of fiber mRNAs associated with differentiation and development.

5. Isolation and characterization of mitochondrial DNA of _G. hirsutum._

6. Molecular basis of a maternally inherited transposable element.

7. Introgression of new wild species cytoplasms into _G. barbadense_ semigametic nuclear background. (Currently 8 diploid and 3 tetraploid species being introgressed.)

8. Interspecific hybridization to make wild species amenable to recombination with cultivated species (ovule culture).
9. Transfer of caducous bract from *G. amourianum* (2X) to *G. hirsutum* (4X).
10. Increase of *Gossypium* seed collected in Australia.
11. Cytogenetic analysis of interspecific hybrids.
12. Taxonomic descriptions of undescribed taxa and poorly described species of *Gossypium* collected in Australia.
13. Analysis of an apparent cline between *G. populifolium* and *G. pilosum*.

PERSONNEL

James McD. Stewart, Research Leader, Plant Physiologist

ADDRESS

Cotton Physiology Research
Mid South Area, SR, ARS, USDA
Department Plant & Soil Science
P.O. Box 1071
Knoxville, Tennessee 37901-1071

TELEPHONE

Comm: (615) 974-8832

Textiles and Clothing Laboratory
Knoxville, Tennessee

PROGRAM MISSION

The mission of this unit is to conduct basic and applied research on the most effective use and care of textiles, clothing, and home furnishings available to consumers and for use of textiles in agricultural applications. This is achieved by (a) developing scientific principles for improving service life, comfort, durability, aesthetic qualities, safety and health aspects of textiles, and for most effectively utilizing them for energy conservation, and (b) developing methods and instrumentation for evaluating functional and aesthetic textile properties to predict service life, acceptability, and performance levels wanted and needed by consumers, farmers, and other users.

ARS PROGRAM IDENTIFICATION

1.2.1 Develop cost-effective conservation technologies for controlling soil loss from croplands and rangelands.

4.1.1 Characterize the basic, physical, chemical, and aesthetic properties of plant and animal materials that enhance their usefulness.

4.1.2 Identify the biological and biochemical mechanisms, in plants and animals, that affect properties of agricultural materials.

4.1.4 Devise concepts for innovative and improved processes and products.

CURRENT RESEARCH

1. Determine factors that influence the persistence of microorganisms on cotton and cotton blend fabrics.

2. Investigate reduction of indoor air pollution by use of cellulosic textiles.

3. Measure, predict, and optimize thermal properties of all types of textiles and their most effective use in conserving energy and providing thermal benefit to consumers and in agricultural uses.

4. Evaluate and predict aesthetic and functional behavior of nonwovens for consumer end uses, and evaluate use of cotton waste as a synthetic fiber substitute for nonwovens products in a PL-480 project with India.

5. Evaluate various woven and nonwoven fabrics for use as geotextiles in erosion control and other soil/water applications.

6. Evaluate simulated commercial dyeing of all types of fabrics to determine bioavailability of potentially hazardous dyes in liasion with government regulatory agencies.

PERSONNEL

Tyrone L. Vigo, Research Leader, Supervisory Research Chemist
Charles B. Hassenboehler, Research Physicist
Kei-yi Wei, Research Chemist
Cynthia M. Frost, Chemist

ADDRESS

Textiles and Clothing Laboratory
Mid South Area, SR, ARS, USDA
1303 W. Cumberland Avenue
Knoxville, Tennessee 37916

TELEPHONE

Comm: (615) 974-5249
FTS: 854-4533

Southern Regional Research Center
New Orleans, Louisiana

PROGRAM MISSION

The mission of the Director's Office is to provide policy, guidelines, and leadership in developing and maintaining productive research programs that address the agricultural utilization problems in the region. Important elements in accomplishing the mission include communication with other ARS locations, other USDA agencies, other Federal agencies, industry, educational organizations, associations, and the public.

ARS PROGRAM IDENTIFICATION

Objective 2	Develop the means for maintaining and increasing the productivity and quality of crop plants.
Objective 4	Develop the means for achieving maximum use of agricultural products for domestic markets and export.
Objective 5	Develop the means for promoting optimum human health and well-being through improved nutrition and family resource management.

PERSONNEL

Ivan W. Kirk, Center Director

ADDRESS

Southern Regional Research Center
Mid South Area, SR, ARS, USDA
P.O. Box 19687
New Orleans, Louisiana 70179-9687

TELEPHONE

Comm: (504) 589-7511
FTS: 682-7511

Food and Feed Quality Research Unit
New Orleans, Louisiana

PROGRAM MISSION

The mission is to identify and quantify those constituents that contribute to or function as the detriminants of end-use value of commodities/ products. The subobjectives of this research are (1) identification of those constituents in raw peanuts and egg products important to end-use value and wholesomeness; (2) development of rapid objective monitoring procedures for monitoring flavor, wholesomeness and acceptability of plant and animal products and computer programs where appropriate for predicting flavor and wholesomeness of peanuts and eggs; (3) identification of those constituents that contribute to the desired texture in cooked rice and development of screening procedures to identify those constituents for rice breeders; (4) characterization of physicochemical properties that limit the nutritive value of grain sorghum and correlate this data with *in vitro* analyses; and (5) identification of inherent and adventitious constituents of sugar cane that affect quality and yield of cane sugar, and development of new concepts for producing cane sugar.

ARS PROGRAM IDENTIFICATION

4.1.1 Characterize the basic, physical, chemical, and aesthetic properties of plant and animal materials that enhance their usefulness.

4.1.2 Identify the biological and biochemical mechanisms, in plants and animals, that affect properties of agricultural materials.

CURRENT RESEARCH

1. Flavor research

   Develop rapid chromatographic procedures for volatile organic compounds which predict the flavor and acceptability of eggs and peanuts.

2. Rice research

   Characterize starch components and their interactions with other constituents which influence texture in cooked rice.

3. Grain sorghum research

   Improve feed value of grain sorghum for broiler chickens by processing or by modification including the use of enzymes or other additives.

4. Sugar cane research

   Analyze polysaccharides and minerals in sugar cane that affect yield of cane sugar, and develop filtration systems to reduce energy consumption in cane sugar production.

PERSONNEL

Fred W. Parrish, Research Leader, Supervisory Research Chemist
August V. Bailey, Research Chemist
Susan W. Biel, Research Microbiologist
Mona L. Brown, Chemist
Frank G. Carpenter, Research Chemist
Joseph H. Chrastile, Research Chemist
Louis P. Codifer, Chemist
Galoust M. Elgal, Chemical Engineer
Michael G. Legendre, Chemist
Norman V. Lovegren, Research Chemist
John P. Madacsi, Research Chemist
Cletus E. Morris, Research Chemist
Floyd L. Normand, Research Chemist
Carolyn H. Vinnett, Food Technologist

ADDRESS

Food and Feed Quality Research
Southern Regional Research Center
Mid South Area, SR, ARS, USDA
P.O. Box 19687
New Orleans, Louisiana 70179-9687

TELEPHONE

Comm: (504) 589-7533
FTS: 682-7533

Oilseed Protein Chemistry Research
New Orleans, Louisiana

PROGRAM MISSION

The mission is to develop a basic understanding of the relationships among protein composition, structure, modification, and functionality. The research is not necessarily commodity oriented; i.e., methodology and research directives are applicable to any problem area in protein chemistry. Specifically, the program (1) identifies and characterizes nonprotein constituents and/or their interactions with proteins and other polypeptides that affect optimum end-use properties of oilseeds; (2) determines the nutritionally significant complexations of individual and mixtures of metal ions and amino acids with phytic acid; (3) determines the physicochemical characteristics of polypeptides that contribute to the basic structure of proteins, and, in turn, their functional and nutritional properties; (4) explores the biosynthetic mechanisms that control protein activities in oilseeds; and (5) develops cost effective chemical and immobilized enzyme technologies for the modification of oilseed proteins by methods such as phosphorylation and deamidation to impart quality, function, and nutritional properties. The knowledge developed on the chemistry of proteins and on their contribution to functional and nutritional properties are essential to technological advancements in the industry and the maintenance of farm value.

ARS PROGRAM IDENTIFICATION

4.1.1 Characterize the basic, physical, chemical, and aesthetic properties of plant and animal materials that enhance their usefulness.

4.1.4 Devise concepts for innovative and improved processes and products.

CURRENT RESEARCH

1. Basic physicochemical characteristics of oilseed protein and nonprotein constituents

   Isolate, purify, and characterize the polypeptides of glandless cottonseed storage proteins, and study their interactions with other components.

   Investigate nonprotein components that influence taste, color, and texture of glandless cottonseed flour.

2. Functional properties of vegetable proteins

   Determine effects of hydrolysis and deamidation on the functional behavior of glandless cottonseed flour. Explore enzyme immobilization to modify the proteins.

   Develop phosphorylating agents based on polymer-supported sulfonamides to modify glandless cottonseed proteins.

Oil and Protect [illegible]

[illegible]

[illegible]

[illegible] specifically [illegible]

[illegible]

Analyze phospholipids of glandless cottonseed flour by chromatographic separation methods.

3. Mechanisms of complexation of metal ions and amino acids with phytic acid

Study the interaction of copper, iron, and other biologically essential metal ions with phytic acid under a variety of conditions by calorimetric, titration, and analytical methods.

(Extramural -- University of Chicago) Apply titration microcalorimetry and potentiometric techniques to this study.

PERSONNEL

Arlen W. Frank, Research Chemist, Acting Research Leader
Florine A. Blouin, Research Chemist
William J. Evans, Research Chemist
Gordon S. Fisher, Research Chemist
Henry F. Marshall, Jr., Research Chemist
Fredrick F. Shih, Research Chemist

ADDRESS

Oilseed Protein Chemistry Research
Southern Regional Research Center
Mid South, SR, ARS, USDA
P.O. Box 19687
New Orleans, Louisiana 70179-9687

TELEPHONE

Comm: (504) 589-7588
FTS: 682-7588

Food and Feed Engineering Research
New Orleans, Louisiana

PROGRAM MISSION

The mission is to (1) develop improved methods of handling and processing agricultural products which reduce losses, improve energy efficiency, and maintain nutritive and other product quality factors; (2) investigate the role of food processing methods on distribution of natural or added trace metals in typically processed foods; (3) develop innovative and economical processes for extracting oil and removing antinutrients from oilseeds using solvent systems from biorenewable resources; (4) isolate, identify, and eliminate ecology-related factors that contribute to off-flavor in pond-cultured freshwater fish; and (5) consult and cooperate with other research units on engineering problems and process scale-ups.

ARS PROGRAM IDENTIFICATION

4.1.1 Characterize the basic, physical, chemical, and aesthetic properties of plant and animal materials that enhance their usefulness.

4.1.4 Devise concepts for innovative and improved processes and products.

4.4.1 Identify system inefficiencies.

5.2.2 Determine bioavailability of nutrients in foods as consumed.

CURRENT RESEARCH

1. Utilize solvents from renewable resources for oilseed extraction

   Determine optimum conditions for extracting cottonseed oil.

   Investigate recycling techniques to minimize energy-consuming evaporation and distillation operations.

   Develop continuous pilot plant extraction process for removing oil, aflatoxin, and gossypol from cottonseed.

2. Reduced losses and improved energy efficiency from innovative rice handling techniques

   Determine and exploit variations in properties of rice kernels of differing thicknesses to improve milled quality, reduce processing losses, and reduce energy requirements for drying and processing thinner kernels.

   Evaluate physicochemical and nutritional properties of rice and thin rice kernels for use in new PL-480 type blended foods for infants.

Investigate microwaves for rice drying and develop models to simulate relationships among dryer operating parameters and rice drying characteristics.

Develop computerized image analysis methods for rice breeders to evaluate the quality of new rice varieties grown in the Uniform Yield Nurseries.

3. Biochemical mechanisms of trace metal bioavailability in processed foods

Determine the role of commmonly used food ingredients and processing conditions for bread on trace metal distribution in model systems.

Optimize the bread processing operation for trace metal bioavailability and product quality.

4. Higher-valued protein food products from peanuts

Develop air classificaton technology for food grade protein concentrates.

Optimize processing conditions for quality and storage life.

5. Ecosystem related off-flavors in economically important aquacultural species

Identify--organoleptically and chemically--types of ecosystem-related off-flavors in farm-raised cat fish.

Determine environmental conditions responsible for off-flavor compounds.

Investigate off-flavor compound deposition and develop elimination/ control procedures.

PERSONNEL

Stanley P. Koltun, Research Leader, Supervisory Chemical Engineer
Kenneth M. Decossas, Chemical Engineer
Joseph Pominski, Chemical Engineer
James I. Wadsworth, Chemical Engineer
Donald W. Freeman, Research Food Technologist
Thomas P. Hensarling, Research Chemist
Robert J. Hron, Chemical Engineer
Ranjit S. Kadan, Research Food Technologist
Gerald B. Verburg, Research Chemist
George Abraham, Chemical Engineer
Susan K. Waage, Research Chemist

ADDRESS

Food and Feed Engineering Research
Southern Regional Research Center
Mid South Area, SR, ARS, USDA
P.O. Box 19687
New Orleans, Louisiana 70179-9687

TELEPHONE

Comm: (504) 589-7521
FTS: 686-7521

Biochemical Mechanisms Research
New Orleans, Louisiana

PROGRAM MISSION

The mission is to identify the chemical constituents that contribute to (a) desirable or undesirable quality determinants of peanuts and peanut products for applications by breeders and processors; (b) stress-induced modifications in various tissues/tissue components of agricultural crops; and (c) causes and prevention of off-flavors in meat and fish. Additionally, the mission is to determine the effects of natural and/or synthetic bioregulators on the composition and properties of oilseeds and to elucidate the biochemical mechanisms altered by such bioregulators; and to investigate the activity of sugar metabolizing enzymes in normal and acquired monosaccharide intolerant children.

ARS PROGRAM IDENTIFICATION

2.3.1 Develop knowledge of basic plant growth and development processes of crop species and of micro-organisms of agricultural importance.

4.1.2 Identify the biological and biochemical mechanisms, in plants and animals, that affect properties of agricultural materials.

4.1.3 Devise means for regulating and controlling the biological processes that enhance usefulness.

5.1.1 Establish the nutrient requirements of infants, children, and adolescents.

CURRENT RESEARCH

1. Effects of bioregulators on oilseed quality and properties.

   Identify and quantitate changes in major constituents--proteins, carbohydrates, lipids; and selected minor constituents--polyphenolics, lipoxygenase, polyphenol-oxidase--that affect flavor and quality.

   Identify flavonoid compounds that can be used as chemical markers for breeding purposes.

   Identify the action sites of bioregulators and elucidate their mechanisms of action.

2. Effects of stress on chemical components of growing cotton plants.

   Identify qualitative and quantitative alterations in carbohydrates and/or organic acids, and membrane and storage lipids of plants subjected to water stress during growth.

   Utilizing above information, provide a sensitive method for determining the onset of stress prior to morphological expression in the plants.

Assess the effects of stress on biochemical mechanisms that regulate agronomic growth.

3. Causes and prevention of off-flavors in meats and fish

   Investigate the mechanisms of lipid peroxide formation and degradation in animal fats before, during, and after cooking.

   Investigate the chemistry of iron-porphyrin systems in meats and their catalytic role in lipid oxidation.

   Study the effects of naturally-occurring antioxidants on inhibition or control of lipid oxidation.

   Identify major reaction products associated with warmed-over-flavor.

4. Metabolism of sugars by normal and sugar-intolerant children

   Establish a base line for sugar metabolism and the activity of pertinent enzymes in normal children.

   Identify alterations in enzyme profiles of sugar-metabolizing systems in acquired monosaccharide intolerant children (AMI).

PERSONNEL

Robert L. Ory, Research Leader, Research Chemist
Allen J. St. Angelo, Research Chemist
Donald J. Daigle, Research Chemist
Edith J. Conkerton, Research Chemist
Judy D. Timpa, Research Chemist
Alden Reine, Research Chemist
Barbara A. Triplett, Plant Physiologist

ADDRESS

Biochemical Mechanisms Research
Southern Regional Research Center
Mid South Area, SR, ARS, USDA
P.O. Box 19687
New Orleans, Louisiana 70179-9687

TELEPHONE

Comm: (504) 589-7075
FTS: 682-7075

Fiber Structure - Physics & Chemistry Research
New Orleans, Louisiana

PROGRAM MISSION

The mission is to (a) apply principles of physics and chemistry and the latest research techniques and instrumentation to gain a better understanding of the molecular architecture and microstructure of fibers and the electronic nature of their surfaces for the ultimate purpose of improving both the production and utilization of natural fibers with emphasis on cotton fibers; and (b) relate chemical properties and reactivities of cellulose to physical properties of cotton fibers and to their subsequent utilization in yarns, fabrics, and finished textiles.

ARS PROGRAM IDENTIFICATION

4.1.1 Characterize the basic, physical, chemical, and aesthetic properties of plant and animal materials that enhance their usefulness.

4.1.4 Devise concepts for innovative and improved processes and products.

CURRENT RESEARCH

1. High quality cottons suitable to high-speed processing.

Develop techniques using computerized image analyses that classify fibers with respect to maturity and fineness and relate these to ease of processing.

Use electron scanning and transmission microscopical analyses to elucidate development of the cotton fiber and identification of characteristics essential to mature cottons of high quality.

Develop physico-chemical methods that will classify or predict cottons that will be easy to process.

2. Basic mechanisms involved in the penetration of the cellulose fiber by aqueous and nonaqueous solvents

Develop instruments that yield objective evaluations of the accessibility of a given reagent to cotton fibers of known maturities.

Establish parameters--temperature, pressure, and nature of solvent--required for conversion of Cellulose I to Cellulose III.

Correlate date obtained via sophisticated instruments with data obtained via simplistic methods to provide mill operators with a method of predicting accessibility of cottons to solvents.

3. Basic understanding of the role of surface properties of cotton

   Analyze surfaces of cottons by non-destructive techniques to establish surface characteristics associated with high quality.

   Modify celluloses and cellulosic derivatives via surface etchings and correlate changes with physical and chemical properties.

4. Chemical modifications of cotton to improve resistance to UV-visible and/or oxidative degradations and to improve dyeing and/or soiling soil release properties.

   Establish conditions for surface modifications of celluloses to improve end-uses at relative low add-ons.

   Study effects of the electronic nature of substituent groups of modified celluloses on physical and chemical properties of end-products.

   Determine advantages of *in situ* catalysts in the chemical modification of cottons.

PERSONNEL

Ruth R. Benerito, Reseach Leader, Supervisory Research Chemist
Truman L. Ward, Research Physicist
Oscar Hinojosa, Research Physicist
Devron P. Thibodeaux, Research Physicist
Lawrence Y. Yatsu, Research Botanist
Timothy A. Calamari, Research Chemist
Darrell J. Donaldson, Research Chemist
Wilton R. Goynes, Research Chemist
Eileen K. Boylston, Research Chemist

ADDRESS

Fiber Structure - Physics & Chemistry Research
Southern Regional Research Center
Mid South Area, ARS, USDA
P.O. BOx 19687
New Orleans, Louisiana 70179-9687

TELEHONE

Comm: (504) 589-7566
FTS: 682-7566

Cotton Quality Research
New Orleans, Louisiana

PROGRAM MISSION

The mission is to (1) identify and describe fiber properties which contribute to improved processing efficiency and enhanced end-use performance; (2) develop measures of appropriate parameters which can be used at the breeder and production research levels for identification of improved genetic types and cultural practices, including mechanization and ginning; (3) establish relationships of genotype, environment, culture and other production variables to quality which can be used to improve the efficiency and effectiveness of research on cotton breeding and production; (4) adapt and modify testing technology for evaluating and predicting end use properties of fibers, fiber assemblies, textiles, and other materials under study at the Center; and (5) determine physical properties of these materials in order to assess modifications made by other research units.

ARS PROGRAM IDENTIFICATION

2.2.3 Improve genetic populations of field crops.

2.3.3 Develop basic ecological principles and improved cultural and management practices for field crops.

4.1.1 Characterize the basic, physical, chemical, and aesthetic properties of plant and animal materials that enhance their usefulness.

CURRENT RESEARCH

1. Environmental and biological effects on cotton quality

Quantitate and investigate the biological basis for genotypic, environmental, and genotypic X environmental interaction effects for fiber yield, quality and the correlation of yield and quality, with emphasis on the effect of day and night temperatures and water stress during boll development.

Evaluate prediction equations for relating fiber property variability to yarn and other textile product performance. Emphasis is given to identifying new fiber properties, which include fiber surface properties. fineness-maturity relationships, cohesive force and length uniformity.

Develop instrumentation to identify genetic entities and cultural practices, harvesting, and ginning which improve processing efficiency and end-use performance.

Manage the National Cotton Variety Testing Program, including preservation and cataloging data obtained since 1960. Summarize and publish current year's test data, and use the accumulated data to study genotype X environment interaction variation and adequacy of testing procedures.

2. Effects of structure and morphology on physical properties

Conduct research concerning the properties of cellulose molecules in terms of yarn properties and end-use performance of finished fabrics. Determine the effects of surface properties, cohesive force and fineness-maturity relationships on strength translation and end-use performance.

Conduct research into the nep problem of cotton to determine the relationship of fiber properties to nepping potential as affected by genotype, ginning, and processing.

PERSONNEL

Harmon H. Ramey, Jr., Research Leader, Supervisory Research Geneticist
Richard S. Krowicki, Research Physicist
Robert J. Miravalle, Geneticist
Jacques J. Hebert, Research Physicist
Clinton P. Wade, Research Chemist

ADDRESS

Cotton Quality Research
Southern Regional Research Center
Mid South Area, ARS, USDA
P.O. Box 19687
New Orleans, Louisiana 70179-9687

TELEPHONE

Comm: (504) 589-7509 or 589-7547
FTS: 682-7509 or 682-7547

Food and Feed Safety Research
New Orleans, Louisiana

PROGRAM MISSION

Research is directed towards definition of the mycotoxin problem in Southern-grown crops; the development of improved analytical methods for mycotoxins of significant import; isolation, purification and structure determination of new mycotoxins; examination of fungal-plant ecosystems; determination of genetic mechanisms that affect mycotoxin production in Southern commodities; analyses of agricultural dusts for toxic substances and the biological mechanism of action of these toxins; study of the effect of naturally-occurring stimulators and inhibitors of immunological processes in cell culture systems.

ARS PROGRAM IDENTIFICATION

4.2.2 Identify and, when necessary, develop the means for removing extrinsic toxic factors of practical significance.

CURRENT RESEARCH

1. Mycotoxin contamination of cottonseed and corn

   Identify the role of environmental factors that affect fungal infection of developing seed.

   Characterize the specific relationships between plant stress and increased susceptibility of developing seed to fungal infection.

   Elucidate the unique sequence of cellular events associated with fungal infection of seed and production of toxin substances.

   Elucidate fundamental biological properties of toxin-producing fungi in terms of linkages between regulation of cellular metabolism and invasiveness of fungal cells in living plant tissues.

2. Mycotoxins in agricultural dusts

   Identify pertinent mycotoxins in respirable grain and oilseed dusts.

   Quantify the presence of biologically relevant bacterial and fungal species in agricultural dusts.

3. Structural aspects of mycotoxins

   Elucidate the variations in biological activity of the trichothecene mycotoxins detected in contaminated grain.

   Develop potential detoxification procedures for the toxic trichothecenes through characterization of active regions of the toxic compounds and method for effecting desired chemical modifications.

Develop rapid and economical detection methods for fungal toxins based on specific chemical reactions.

4. Plant resistance to fungal infection

Identify the host-plant response to infection by toxin-producing fungi in terms of increased resistance via photoalexin production.

Characterize fundamental cellular processes involved in host-plant resistance to fungal attack, such as initiation of active oxygen-generating systems, at the initial penetration site.

Biotechnology for conversion of soy and cottonseed meals

Improve the quality of soy and cottonseed meal by enzymatic removal of antinutritional substances such as phytate, gossypol and flatulence-producing sugars.

Employ recombinant DNA technology to produce pertinent enzymes.

Biologically active peptides

Employ recombinant DNA technology for increased microbial production of biologically active peptides that can be utilized in control of weeds, insects and microbial pathogens.

Elucidate the genetic components of bioactive peptides that might be incorporated into plant lines to achieve desired objectives.

PERSONNEL

Eivind B. Lillehoj, Research Leader, Research Microbiologist
Louise S. Lee, Research Chemist
Kenneth C. Ehrlich, Research Chemist
Maren A. Klich, Research Microbiologist
Jay E. Mellon, Research Plant Physiologist
Thomas J. Jacks, Research Plant Physiologist
Joseph N. Neucere, Research Chemist
Hampden J. Zeringue, Research Chemist

ADDRESS

Food and Feed Safety Research
Southern Regional Research Center
Mid South Area, ARS, USDA
P.O. Box 19687
New Orleans, Louisiana 70179-9687

TELEPHONE

Comm: (504) 589-7591
FTS: 682-7591

Industrial Environmental Health Research
New Orleans, Louisiana

PROGRAM MISSION

The mission is to characterize chemical constituents of cotton dust and major plant parts contributing to the dust and biological activity related to byssinosis; evaluate bioassay systems for byssinosis causatives; characterize materials derived from agricultural commodities by separation and spectroscopic techniques such as gas and liquid chromatography, infrared, nuclear magnetic resonance, GC/MS, atomic absorption, and x-ray analyses; develop an instrumental method for the determination of endotoxins in cotton and cotton dust; characterize washed cottons and the material removed from them; characterize byssinogenic materials using immunochemical techniques; and support Center research with sophisticated spectroscopic techniques.

ARS PROGRAM IDENTIFICATION

4.2.1 Identify and, when necessary, develop the means for removing intrinsic toxic factors of practical significance.

4.2.2 Identify and, when necessary, develop the means for removing extrinsic toxic factors of practical significance.

CURRENT RESEARCH

1. Causative agent of byssinosis

Analyze cotton, cotton dust, and plant parts to develop basic information about possible causative agents.

Analyze body fluids from human panelists or test animals before and after exposure to cotton dust and/or bracts to identify biologically active species.

2. Endotoxins

Develop a rapid and accurate instrument for measuring endotoxin content in cotton, cotton dust, and plant parts.

Develop basic information on endotoxins by analyzing fatty acid and carbohydrate profiles.

3. Immunochemistry

Develop procedures for obtaining active aqueous extracts of cotton dust for injecting chimpanzees to induce formation of antibodies for further immunochemical characterization.

Determine the structure of these active fractions.

4. Characterization of washed cotton

Develop microanalytical techniques to characterize inorganic and organic compounds found in raw cotton and for identification of suitably clean cottons.

Develop instrument methods to differentiate between washed and unwashed cottons.

Correlate data from wet chemical analyses, surface analyses, and instrument data to evaluate changes caused by water washing.

5. Near Infrared Research

Develop Near Infrared (NIR) methods in combination with advanced statistical analyses to identify active fractions and compounds from cotton dust.

Correlate measurements from NIR with lung function data obtained from panelists exposed to active cotton dust.

PERSONNEL

Ralph J. Berni, Research Leader, Supervisory Research Chemist

Research Chemists:

Leon H. Chance
Antonio A. Sekul
Joseph G. Montalvo
William E. Franklin
Samuel E. Ellzey
Linda N. Domelsmith
Nancy M. Morris
Mary Alice Rousselle
James H. Wall
Ricardo H. Wade
Andrew G. Pierce
Joseph S. Bruno

ADDRESS

Industrial Environmental Health Research
Southern Regional Research Center
Mid South Area, SR, ARS, USDA
P.O. Box 19687
New Orleans, Lousisiana 70179-9687

TELEPHONE

Comm: (504) 589-7547
FTS: 682-7547

Fiber and Yarn Processing Research
New Orleans, Louisiana

PROGRAM MISSION

The mission is to (1) develop new approaches and techniques for processing cotton textiles and to apply technological advances from other scientific fields to problems associated with the efficient processing, handling, and evaluation of fibrous materials, which includes the electrostatic transport of fibrous and other agri-particulates to conserve energy; and (2) develop new and innovative methods of converting cotton and blends of cotton with other textile fibers into quality yarns. These methods include (a) the technique to manufacture no-twist yarn directly from cotton card web; and (b) the method to spin a cotton yarn electrostatically.

ARS PROGRAM IDENTIFICATION

4.1.4 Devise concepts for innovative and improved processes and products.

CURRENT RESEARCH

1. No-twist cotton yarns from card web

Develop and evaluate techniques and equipment to produce quality no-twist cotton yarns directly from card web. Evaluate suitability of no-twist yarns for various fabric constructions. Investigate the relationship between no-twist yarn properties and fabric properties.

Replace the bonding agent of the no-twist yarn with a wrapping filament that can subsequently be removed during fabric construction to produce no-twist cotton yarns from card web.

2. Alleviate nepping

Develop instrument to measure neppiness of cotton before processing and to determine flaws in finished fabric.

Determine nepping potential of cotton fiber.

3. Electrostatic forces

Apply electrostatic forces to produce clean cotton, remove trash under and around textile machinery and transport and separate cotton fibers and non-lint dust/trash.

Develop electrostatic high-speed spinning systems for cotton fibers.

Significantly increase the conversion efficiency of natural fibers into cotton and cotton-rich core-wrap yarns via technologically advanced staple fiber spinning units such as the DREFT-3 system to produce specially constructed yarns at enhanced production efficiencies and high quality.

PERSONNEL

Albert Baril, Jr., Research Leader, Supervisory Research Physicist
Gain L. Louis, Supervisory Research Textile Engineer
Kearny Q. Robert, Research Physicist
Harold L. Salaun, Jr., Research Mechanical Engineer
James M. Hemstreet, Research Physicist
Louis C. Weiss. Research Physicist
Heber W. Weller, Research Physicist
Patricia Bel, Materials Research Engineer
Linda B. Kimmel, Materials Research Engineer

ADDRESS

Fiber and Yarn Processing Research
Southern Regional Research Center
Mid South Area, SR, ARS, USDA
P.O. Box 19687
New Orleans, Louisiana 70179-9687

TELEPHONE

Comm: (504) 589-7582
FTS: 682-7582

Cotton Chemical Reactions Research
New Orleans, Louisiana

PROGRAM MISSION

The mission of the Unit is (a) to improve aesthetic qualities and utilitarian properties of cotton textiles by conducting basic research designed to elucidate the mechanisms of cellulose reactions with conventional and new reagents so that high performance, chemically finished cottons can be produced; (b) to elucidate the mechanisms of durable press, flaming combustion, smoldering combustion, and other chemical reaction-structure-performance relationships; (c) to develop new finishing reagents for special substrates and specific performance characteristics; and (d) to clarify structural features of the cotton fiber pertinent to chemical reactions within the cotton fiber. Ancillary activities include determining (1) the basics of cellulose-formaldehyde and cellulose-N-methylolurea reactions; and (2) the mechanisms of polymerization and/or crosslinking reactions in cotton, distribution of cross-links, and other structural features realting to formation of superior durable press cottons.

ARS PROGRAM IDENTIFICATION

4.1.1. Characterize the basic, physical, chemical, and aesthetic properties of plant and animal materials that enhance their usefulness.

4.1.2 Identify the biological and biochemical mechanisms, in plants and animals, that affect properties of agricultural materials.

4.1.4 Devise concepts for innovative and improved processes and products.

CURRENT RESEARCH

1. Formaldehyde-free durable press reagents for cotton

Investigate the reaction of compounds on cotton fiber and with simple alcohols to provide knowledge needed for development of formaldehyde-free finishing agents.

Find and characterize new mechanisms of catalysis applicable for formaldehyde-free, non-nitrogeneous cross-linking reagents.

2. Decomposition of cotton finishes

Conduct fundamental studies of the stability of durable press finishes from N-methylol and other agents on cotton.

Investigate the influence of interacting factors of processing and use on stability as indicated by formaldehyde release.

Identify and isolate sources of bias in analyses for releasable formaldehyde to improve sensitivity, precision, and accuracy.

3. Improved durable press cotton

Investigate pore size distribution in cotton fibers to provide knowledge relevant to penetration of chemical reagents.

Determine the effect of durable press processing techniques on the distribution of cross-linking reagents in fabric and relate this to textile performance.

Characterize and clarify the significance of internal strain in the microstructure of the cotton fiber.

Determine interactions among durable press processing variables and their effects on textile performance properties.

Investigate alterations in effective length, flexibility, rotational freedom, molecular volume, polarity and degree of branching on modified cross-linkages in cotton.

4. Flaming and smoldering combustion

Develop methods for measuring cigarette ignition susceptibility of cotton upholstery fabrics to reduce smoldering hazard and to determine how smolder suppressant agents function.

Determine the effect of substituent structure and site of substitution on the thermal and flaming properties of chemically modified cotton.

PERSONNEL

Noelie R. Bertoniere, Acting Research Leader, Research Chemist
Clark M. Welch, Research Chemist
John G. Frick, Research Chemist
Robert M. Reinhardt, Research Chemist
Bethlehem K. Andrews, Research Chemist
John V. Beninate, Research Chemist
Elwood J. Gonzales, Research Chemist
Brenda J. Trask, Research Chemist

ADDRESS

Cotton Chemical Reactions Research
Southern Regional Research Laboratory
Mid South Area, SR, ARS, USDA
P.O. Box 19687
New Orleans, Louisiana 70179-9687

TELEPHONE

Comm: (504) 589-7095
FTS: 682-7095

Fabrics Systems Research
New Orleans, Louisiana

PROGRAM MISSION

The mission is to improve efficiency and to reduce costs of converting yarns into fabrics and of finishing fabrics. Problems peculiar to cotton will be addressed. These include the necessity of improving properties, particularly strength of cotton fabrics derived from various yarn structures, problems associated with preparation, energy costs and efficiency of finishing, engineering design and finishing of emerging fabric systems and the hydrophilic properties of cotton. Long range, a systems approach involving yarn and fabric structure and chemical finishing will be utilized to achieve superior cotton-containing fabrics with properties uniquely different from those currently available.

ARS PROGRAM IDENTIFICATION

4.1.1 Characterize the basic, physical, chemical, and aesthetic properties of plant and animal materials that enhance their usefulness.

4.1.4 Devise concepts for innovative and improved processes and products.

CURRENT RESEARCH

1. Fabric design and formation

Investigate the use of high tenacity reinforcing fibers and new yarn structures for the design of high strength lightweight outdoor cotton fabrics.

Demonstrate the feasibility of a systems approach to unique cotton textiles considering the variables of fiber composition, yarn and fabric structure, combined with compatible dyeing and finishing techniques.

Determine the basic characteristics required for effective polymeric sizing agents.

Develop methods for using low-wet pick-up techniques for sizing.

2. Fabric finishing

Investigate aspects of moisture control in cotton finishing, and develop a computer model for optimizing various textile finishing operations.

Improve the performance of cotton fabrics through study of resiliency, flame resistance, weather resistance, and other desirable properties.

Investigate the hydrophilic properties of modified cotton as a function of surface chemistry and electrical charge.

PERSONNEL

Robert J. Harper, Jr., Research Leader, Supervisory Research Chemist
Russell M. H. Kullman, Research Chemist
George F. Ruppenicker, Research Cotton Technologist
Jerry P. Moreau, Research Chemist
Clarence O. Graham, Materials Research Engineer
Allen H. Lambert, Chemical Engineer
Charles L. Shepard, Mechanical Engineer
Ronald A. Holser, Chemical Engineer

ADDRESS

Fabric Systems Research
Southern Regional Research Center
Mid South Area, SR, ARS, USDA
P.O. Box 19687
New Orleans, Louisiana 70179-9687

TELEPHONE

Comm: (504) 589-7581
FTS: 682-7581

Crop Protection Research
New Orleans, Louisiana

PROGRAM MISSION

The mission is to synthesize a series of seed germination stimulants based on strigol and related compounds; to evaluate the effects of such chemicals on seed germination in a number of species; to isolate, identify, and evaluate allelochemicals in selected southern weeds, and to develop and evaluate in cooperation with other scientists, optimized delivery of biologically active materials for crop protection.

ARS PROGRAM IDENTIFICATION

2.4.6 Develop knowledge of the basic biology of weeds determining their vulnerability to control.

2.4.10 Discover principles and develop agricultural chemical technology for reducing crop losses and for modifying plant growth for improved crop protection and production.

CURRENT RESEARCH

1. Synthesis of bioactive compounds

   Improve or develop new reaction procedures for the total synthesis of strigol and selected analogs, selected glyphosate derivatives, and other bioactive compounds as research results indicate.

2. Allelopathy

   Identify allelopathic effects as related to crop protection.

   Isolate, identify, and synthesize (when necessary) allelochemicals.

   Determine mechanisms of plant-plant interactions in parasitic weed and allelopathic ecology.

3. Seed germination

   Devise bioassays for use with the seed germination and dormancy regulation aspects of strigol and allelopathy research.

   Ascertain structure/activity relationships and mode of action of strigol and synthetic analogs in seed germination and dormancy regulation.

4. Greenhouse and field studies

   Cooperate with other ARS and University scientists in studies/application of agrichemnicals and their ultimate fate.

PERSONNEL

Sidney L. Vail, Research Leader, Supervisory Research Chemist
Eugene J. Blanchard, Research Chemist
Judith M. Bradow, Plant Physiologist
William J. Connick, Jr., Research Chemist
Oliver D. Dailey, Jr., Research Chemist
Armand B. Pepperman, Jr., Research Chemist

ADDRESS

Crop Protection Research
Southern Regional Research Center
Mid South Area, SR, ARS, USDA
P.O. Box 19687
New Orleans, Louisiana 70179-9687

TELEPHONE

Comm: (504) 589-7064
FTS: 682-7064